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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the surface mount type oscillator using resonators, such as a surface mount type oscillator connected only to the wiring on the whole surface of a mounting board especially a crystal resonator, and a SAW (surface acoustic wave) resonator.

[0002]

[Description of the Prior Art]In recent years, the surface mount type oscillator to which wiring is connected only on the whole surface (component side) in which the oscillator of the mounting board was mounted as an oscillator is used abundantly with high integration of packaging density. As a surface mount type oscillator stores the hybrid IC which consists of chips for oscillating circuits, such as resonator chips, such as bulk resonators, such as crystal and ceramics, and a SAW (surface acoustic wave) resonator, a silicon transistor of an oscillating circuit, resistance, a capacitor, in one container, it is constituted.

[0003]As such a surface mount type oscillator, the thing of a hermetic seal type is becoming in use because of high-reliability instead of a thing old resin molding type. As a thing of the conventional hermetic seal type, a hybrid IC is constituted on substrates, such as alumina, a resonator chip is arranged on it, and there are some which have stored the alumina substrate in a metal package.

[0004]The inside of a ceramic package is wired, a package and a substrate are formed in one, silicon IC, resistance, a capacitor, etc. are arranged on the wiring in a ceramic package, and there is a thing he is trying to carry a resonator chip on it.

[0005]

[Problem(s) to be Solved by the Invention]However, in the case of the thing using the metal package mentioned above, the metal package itself is cheap in material, but. In order to use a

surface mount type, the insulator had to be inserted in the external lead terminal so that a lead terminal might not contact a metal package, lead homing had to be performed, and there was a problem of becoming expensive as a result.

[0006]In the case of the thing using a ceramic package, the assembly work within a narrow package was difficult, and there was a problem that immobilization of a resonator chip was difficult. And since the silver soldering of the metallic seal frame was carried out to the top layer part of the ceramic package for the hermetic seal, there was a problem of becoming more expensive than a metal package.

[0007]The case of the thing using a metal package and the case of the thing using a ceramic package had the problem that a miniaturization and slimming down were difficult, from the restrictions on structure. The purpose of this invention is simple for assembly work, and providing the surface mount type oscillator of an easy structure has a miniaturization and slimming down.

[0008]

[Means for Solving the Problem]A chip for oscillating circuits with which the above-mentioned purpose has been arranged on the whole surface of a wiring board by which wiring was formed in both sides, and said wiring board, A container which stores a resonator chip arranged upwards on the other hand, and said wiring board, said chip for oscillating circuits and said resonator chip of said wiring board, It is connected to wiring on the whole surface of said wiring board, has the terminal projected from the bottom of said container, and is attained by surface mount type oscillator, wherein said terminal is connected only to wiring on a component side of a mounting board.

[0009]

[Function]The wiring board which has arranged the chip for oscillating circuits on the whole surface, and has arranged the resonator chip upwards on the other hand is stored in a container, and the terminal connected to the wiring on the whole surface of a wiring board is made to project inside from the bottom of a container in this invention. therefore, it can assemble easily -- both, it can miniaturize easily and the whole can be slimmed down.

[0010]

[Example]The surface mount type oscillator by one example of this invention is explained using drawing 1. Drawing 1 (a) is a top view of a surface mount type oscillator, and drawing 1 (b) is a sectional view. In this example, the metal package 10 with electromagnetic shielding nature is used as a container of hermetic sealing. The crevice 10a for storing parts is formed in the inside of this metal package 10.

[0011]a circular hole is formed in four corners in order to provide a terminal in the bottom of the

metal package 10 -- this hole -- the terminals 14A, 14B, 14C, and 14D electrically insulated with the glass 12 are formed inside. The flexible printed circuit board 16 with a thickness of 125 micrometers by which the circuit pattern connected mutually was formed in both sides as a wiring board made from polyimide is used. IC chip 18 which is a monolithic integrated circuit which constitutes an oscillating circuit is carried in the undersurface of the flexible printed circuit board 16, and the crystal-resonator chip 22 is carried in the upper surface.

[0012]In order to connect IC chip 18 with the flexible printed circuit board 16, As shown in drawing 1 (c), the mesa-like vamp 16a by B-TAB (Bump-Tape Automated Bonding) is formed in the undersurface of the flexible printed circuit board 16, and IC chip 18 is connected to it via the mesa-like vamp 16a. The transfer vamp 16b is formed in the undersurface of the flexible printed circuit board 16, and it may be made to connect IC chip 18 via the transfer vamp 16b, as shown in drawing 1 (d).

[0013]Cantilever immobilization of the crystal-resonator chip 22 of 0.1-mm thickness is carried out by the right-hand side electroconductive glue 20 with the oscillating frequency of 16 MHz at the upper surface of the flexible printed circuit board 16. The electrode 22A of the upper surface of the crystal-resonator chip 22 is connected electrically mechanically to wiring (not shown) of the flexible printed circuit board 16 by the electroconductive glue 20, The electrode 22B of the undersurface of the crystal-resonator chip 22 is connected electrically mechanically to wiring (not shown) of the flexible printed circuit board 16 by the electroconductive glue 20.

[0014]The flexible printed circuit board 16 in which IC chip 18 and the crystal-resonator chip 22 were carried, It is stored in the metal package 10 by using the mounting surface of IC chip 18 as the undersurface, and Wiring (not shown) of the flexible printed circuit board 16 undersurface, The terminals 14A, 14B, 14C, and 14D which it was provided in the metal package 10 bottom, and were projected inside are directly connected electrically mechanically via the electroconductive glue 24.

[0015]The metal cap 26 about 0.125 mm thick pastes the upper surface of the metal package 10, and the inside of an oscillator is closed thoroughly. The whole can form the surface mount type oscillator of this example thinly with about 1-mm thickness. In mounting the surface mount type oscillator of this example in a mounting board (not shown), it carries out direct continuation of the terminals 14A, 14B, 14C, and 14D exposed to the metal package 10 bottom to the wiring on the component side of a mounting board via a field.

[0016]Thus, according to this example, since it is a hermetic seal type, high-reliability is securable, and it is micro and the surface mount type oscillator of an ultra thin type can be realized. Next, the manufacturing method of the surface mount type oscillator by this example is explained using drawing 2 and drawing 3.

[0017]First, the vamp for IC chip 18 connection is formed in the flexible tape for TAB (Tape Automated Bonding) in which wiring was formed to both sides of the flexible tape (Step S100).

This flexible tape is cut and many flexible printed circuit boards 16 are formed. Dicing of the wafer in which many ICs for carrying in the flexible printed circuit board 16 were formed on the other hand is carried out, and IC chip 18 is formed (Step S102).

[0018]Next, IC chip 18 formed at Step S102 is carried in the flexible tape formed at Step S100 by TAB (Tape Automated Bonding) art (Step S104). On the other hand, a crystal resonator forms a large number in a wafer, and forms an electrode in each crystal resonator (Step S106). Next, dicing of the wafer in which many crystal resonators were formed is carried out, and the crystal-resonator chip 22 is formed (Step S108).

[0019]Next, the flexible printed circuit board 16 which cut the flexible tape and in which IC chip 18 was carried is formed. Next, by connecting wiring (not shown) of the flexible printed circuit board 16 undersurface to the terminals 14A, 14B, 14C, and 14D of the metal package 10 prepared beforehand with the electroconductive glue 24, The flexible printed circuit board 16 by which IC chip 18 was carried in the metal package 10 is stored (Step S110).

[0020]Next, the oscillating circuit in IC chip 18 is inspected (Step S112). If an inspection is passed, it will progress to the following step 114, but in a rejected case, a reject is carried out to an inspection as inferior goods. If an inspection is passed, cantilever immobilization of the crystal-resonator chip 22 prepared for the upper surface of the flexible printed circuit board 16 at Step S108 will be carried out on the right-hand side with the electroconductive glue 20 (Step S114).

[0021]Next, the crystal-resonator chip 22 is finely tuned from the metal package 10 upper part, and oscillating frequency is adjusted (Step S116). Thus, according to this example, there is an advantage that adjustment of oscillating frequency can be performed in the culmination of an assembly. Next, the metal cap 26 is joined to the upper surface of the metal package 10, and the inside of an oscillator is closed thoroughly (Step S118).

[0022]Next, an inspection final as an oscillator is conducted (Step S120). If an inspection is passed, it will progress to the following step S122, but in a rejected case, a reject is carried out to an inspection as inferior goods. Next, it is sealed on the surface of the metal cap 26 (Step S122), and it continues, and it is packed up and a series of manufacturing processes are completed (Step S124).

[0023]Thus, the surface mount type oscillator by this example can be assembled easily, and it can tune frequency finely in a culmination. And since TAB art can be used, about 1-mm thickness and a thin surface mount type oscillator can be mass-produced easily. The surface mount type oscillator by other examples of this invention is explained using [drawing 4](#). The same numerals are given to the same component as the surface mount type oscillator of the example shown in [Drawing 1](#), and explanation is omitted.

[0024]The surface mount type oscillator of this example uses a SAW (surface acoustic wave) resonator instead of a crystal resonator. That is, central IDT electrode 30A is formed in the

upper surface of the surface acoustic wave resonator chip 30, and the antenna reflectors 30B and 30C are formed in the both sides of this IDT electrode 30A. The two electrodes of IDT electrode 30A are connected electrically mechanically to wiring (not shown) of the flexible printed circuit board 16 by the electroconductive glue 20.

[0025] Since the electrode is not formed in the undersurface, die bonding of the surface acoustic wave resonator chip 30 can be carried out directly, without establishing an opening in the flexible printed circuit board 16. Also in the surface mount type oscillator of this example, it can assemble easily, and it can be mass-produced easily. [ as well as the above-mentioned example ]

[0026] Not only the above-mentioned example but various modification is possible for this invention. For example, a ceramic package may be used although the metal package was used as a container in the above-mentioned example. The resonator of a crystal resonator or not only a surface acoustic wave resonator but other kinds may be used.

[0027]

[Effect of the Invention] The wiring board which has arranged the chip for oscillating circuits on the whole surface, and has arranged the resonator chip upwards on the other hand is stored in a container, and the terminal connected to the wiring on the whole surface of a wiring board is made to project inside from the bottom of a container by this invention as above.

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[Translation done.]